

Claims

[Claim 1]

A semiconductor device comprising:

a wiring board in which electrode pads are formed on the
5 surface thereof;

a semiconductor element which is disposed on the wiring
board and in which electrodes are formed on the surface
thereof;

bumps for connecting said electrodes to said electrode
10 pads; and

an underfill resin filled between said wiring board and
said semiconductor element to embed said bumps, wherein

said wiring board comprises a solder resist disposed on
the surface of the side on which said electrode pads are
15 formed;

wherein

apertures for exposing said electrode pads are formed on
the solder resist; and

the thickness of said solder resist in the area excluding
20 the area directly above said electrode pads is equal to or
greater than the thickness of said underfill resin disposed
on said solder resist in said area between said wiring board
and said semiconductor element.

[Claim 2]

25 The semiconductor device according to claim 1, wherein
the thickness of said underfill resin disposed on said solder
resist is 50 μm or less.

[Claim 3]

The semiconductor device according to claim 1 or 2,
wherein the volume of said bumps is less than the volume of
said apertures.

[Claim 4]

5 The semiconductor device according to claim 3, wherein
the thickness of said solder resist is 30 μm or more.

[Claim 5]

The semiconductor device according to any of claims 1 to
4, wherein said bumps are formed from solder.

10 [Claim 6]

A method for manufacturing a semiconductor device having
a wiring board in which electrode pads are formed on the
surface thereof, and a semiconductor element in which
electrodes are formed on the surface thereof, wherein said
15 wiring board comprises a solder resist which is disposed on
the surface of the side on which said electrode pads are
formed, and which is provided with apertures for exposing
said electrode pads, said method comprising the steps of:

forming bumps on at least one element selected from said
20 electrode pads and said electrodes;

depositing a liquid resin material on at least a portion
of the area in which said semiconductor element is to be
mounted on said wiring board;

pressing said semiconductor element to said wiring board
25 to connect said electrode pads, said bumps, and said
electrodes to each other;

melting and then solidifying said bumps to join said
electrodes to said electrode pads by way of said bumps; and

curing said resin material and forming an underfill resin so that said bumps become embedded between said wiring board and said semiconductor element, wherein

the distance between said wiring board and said
5 semiconductor element is controlled during the melting of
said bumps in said joining step, and the thickness of said
solder resist in the area excluding the area directly above
said electrode pads is equal to or greater than the thickness
of said underfill resin disposed on said solder resist in
10 said area between said wiring board and said semiconductor
element after said underfill resin has been formed.

[Claim 7]

The method for manufacturing a semiconductor device according to claim 6, wherein the volume of said bumps is
15 less than the volume of said apertures in the step for forming said bumps.

[Claim 8]

The method for manufacturing a semiconductor device according to claim 7, wherein the thickness of said solder
20 resist is 30 μm or more.

[Claim 9]

The method for manufacturing a semiconductor device according to any of claims 6 to 8, wherein the distance between said wiring board and semiconductor element is
25 controlled by controlling the relative position of said semiconductor element with respect to said wiring board in said joining step.

[Claim 10]

The method for manufacturing a semiconductor device according to any of claims 6 to 8, wherein

said bumps are melted while said semiconductor element is being pressed to said wiring board; and

5 the distance between said wiring board and said semiconductor element is controlled by controlling said pressing force in said joining step.

[Claim 11]

The method for manufacturing a semiconductor device
10 according to any of claims 6 to 10, wherein a resin material to which a chemical capable of removing an oxide film is added is used as said resin material.

[Claim 12]

The method for manufacturing a semiconductor device
15 according to any of claims 6 to 11, further comprising a step of carrying out plasma treatment on at least one surface selected from the surface on the side on which said electrode pads are formed on said wiring board, and the surface on the side on which said electrodes are formed on said
20 semiconductor element, between the forming of said bumps and the depositing of said resin material.